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Remarks

OBJECTION TO THE DRAWINGS

The drawings are objected to under 37 CFR 1.83(a) for failing to show every feature of the invention specified in the claims. The official action indicates at the *substrate structure* recited in claim 7 and the *gradient sub-layer* recited in claims 12-13 must be shown or be canceled from the claims.

1. Substrate structure

The applicants respectfully request the Examiner's approval of the new drawing of Figure 10 attached hereto which shows the substrate structure recited in claim 7. Support for the new drawing is described above. The applicants respectfully submit that Figure 10 depicts subject matter already described in the application and therefore adds no new matter to the application.

2. Gradient sub-layer

The applicants respectfully direct the Examiner's attention to Figures 9A and 9B, which shows a gradient sub-layer at 55, as indicated in paragraph [0065].

CLAIM REJECTIONS UNDER 35 USC § 112, SECOND PARAGRAPH

Claims 14-15 are rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. With respect to claim 14, the official action states that it is not clear as what a portion of a nitride semiconductor layer structure according to any one of the previous claims is included in the claim. The official action additionally indicates that claim 15 is dependent on the above rejected claim and therefore is also rejected.

The application claims a nitride semiconductor layer structure and, in claims 14-19, a nitride semiconductor laser fabricated from the nitride

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semiconductor layer structure. A nitride semiconductor layer structure is fabricated in a semiconductor fab on a wafer typically several inches in diameter. The nitride semiconductor layer structure is then subjected to additional processing to make typically hundreds or thousands of semiconductor devices, such as semiconductor lasers. Each of the semiconductor devices includes a portion of the original layer structure.

Paragraph [0027] of the application states in part "The layer structure is then cleaved to form individual lasers. Each nitride semiconductor laser formed as just described incorporates a portion of the nitride semiconductor layer structure." Paragraph [0040] of the application states in part "Figure 2 is a schematic side view of the nitride semiconductor laser 60. The laser 60 is one of many lasers fabricated from the nitride semiconductor layer structure 40 so that each laser incorporates a portion of the layer structure 40."

The applicants respectfully submit that the meaning of the phrase "portion of the nitride semiconductor layer structure term" as used in claims 14 and new claims 16 and 18 is clearly defined in the application and that, as a result, claims 14-19 comply with the requirements of 35 USC § 112, second paragraph. The applicants respectfully request that the rejection under 35 USC § 112, second paragraph, be withdrawn.

C. CLAIM REJECTION UNDER 35 USC § 102(b)

Claims 1-19 are pending in the application. Claims 1-11 and 14-15 are rejected under 35 USC § 102(b) as being anticipated by United States patent application publication 2001/0038656 of Takeuchi et al. (Takeuchi). The official action states:

With respect to claims 1-4, 10-11, and 14, Takeuchi shows in Fig. 8 a nitride semiconductor layer structure comprising a buffer layer 30, a first sub-layer 31, a second sublayer 24 wherein the AlN molar fraction being at least 10% of the second sub-layer is greater than the AlN molar fraction being at least 5% of the first sub-layer (page 3, para. 0033, lines 7-8, and para. 0034, lines 1-3), an optical

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waveguide layer 25, an active layer 26, a first additional sub-layer 28, and a second additional sub-layer 33.

The applicants respectfully submit that the rejection of claims 1-11 and 14-15 under 35 USC § 102(b) as being unpatentable over Takeuchi is improper because United States patent application publication 2001/0038656 was published in the United States on 8 November 2001, less than one year before the 19 December 2001 filing date of the present application. Nevertheless, the applicants will address the issues raised by the official action.

The applicants respectfully submit that the rejection under 35 USC § 102 of claims 1-11 and 14-15 over Takeuchi is improper. For a proper rejection under 35 USC § 102, the cited reference must show every feature of the claimed invention. The applicants respectfully submit that Takeuchi's Figure 8 does not show every feature claimed in claims 1-11 and 14-15.

Claim 1

The applicants respectfully traverse the rejection of their claim 1 because Takeuchi's Figure 8 does not show every feature claimed in claim 1. First, claim 1 recites "a composite layer of a *single-crystal* nitride semiconductor material including AlN on the buffer layer, the composite layer including a first sub-layer adjacent the buffer layer, and a second sub-layer over the first sub-layer." The official action points to Takeuchi's layers 30, 31 and 24 as the buffer layer, first sub-layer and second sub-layer, respectively, of claim 1. Takeuchi's Figure 8 shows layer 31 as a low-temperature buffer including AlN. Paragraph [0055] of Takeuchi's disclosure describes buffer layer 31 as follows: "The buffer layer 31 is fabricated from a nitride semiconductor material that includes AlN. The buffer layer is deposited at a temperature below that at which single-crystal growth occurs." Accordingly, the applicants respectfully submit that Takeuchi's layer 31 cannot accurately be described as a first sub-layer of "a composite layer of a

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single-crystal nitride semiconductor material including AlN", since Takeuchi describes his layer 31 as being a layer of semiconductor material grown at a temperature below that at which single-crystal growth occurs.

Second, claim 1 recites: "a composite layer of a single-crystal nitride semiconductor material including AlN on the buffer layer". The *Merriam-Webster On-Line Dictionary* defines "on" as follows: "used as a function word to indicate position in contact with and supported by the top surface of" (emphasis added). Takeuchi's Figure 8 shows layer 31 separated from layer 30 by N-contact layer 23. Takeuchi's layer 31 is therefore not in contact with Takeuchi's layer 30. Accordingly, the applicants respectfully submit that Takeuchi's layer 31 cannot accurately be said to be "on" layer 30, and Takeuchi cannot accurately be said to disclose "a composite layer of a single-crystal nitride semiconductor material including AlN on the buffer layer" as recited in the applicants' claim 1.

Thus, since Takeuchi does not disclose "a composite layer of a *single-crystal* nitride semiconductor material including AlN on the buffer layer, the composite layer including a first sub-layer adjacent the buffer layer, and a second sub-layer over the first sub-layer", as recited in the applicants' claim 1, Takeuchi does not disclose every feature recited in the applicants' claim 1 and the rejection of the applicants' claim 1 is improper.

The applicants further submit that claims 2-15 are also improperly rejected because they depend on claim 1, which is improperly rejected for the reasons just stated. Claims 2, 3 and 4 are also improperly rejected for the additional reasons set forth below.

Claim 2

The applicants respectfully traverse the rejection of their claim 2 because Takeuchi's Figure 8 does not show every feature claimed in claim 2. Claim 2 recites "an additional composite layer of a single-crystal nitride semiconductor

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material, the additional composite layer including a first additional sub-layer, and a second additional sub-layer." The official action points to Takeuchi's layers 28 and 33 as first additional sub-layer and the second additional sub-layer, respectively, of claim 2. Takeuchi's Figure 8 shows layer 33 as a low-temperature buffer including AlN. Paragraph [0087] of Takeuchi's disclosure describes buffer layer 33 as "the buffer layer 33 of low-temperature-deposited AlGaIn semiconductor material." Takeuchi's paragraph [0055] referred to above describes "low temperature deposited" semiconductor material as being material "deposited at a temperature below that at which single-crystal growth occurs." Accordingly, the applicants respectfully submit that Takeuchi's layer 33 cannot accurately be described as a second additional sub-layer of "an additional composite layer of a *single-crystal* nitride semiconductor material", since Takeuchi describes his layer 33 as being a layer of semiconductor material grown at a temperature below that at which single-crystal growth occurs.

Thus, since Takeuchi does not disclose "an additional composite layer of a *single-crystal* nitride semiconductor material, the additional composite layer including a first additional sub-layer, and a second additional sub-layer", as recited in the applicants' claim 2, Takeuchi does not disclose every feature recited in the applicants' claim 2 and the rejection of the applicants' claim 2 is improper.

Claims 3 and 4

The applicants respectfully traverse the rejection of their claims 3 and 4 because Takeuchi's Figure 8 does not show every feature claimed in claims 3 and 4. In the section of his disclosure cited in the official action Takeuchi discloses a range of AlN molar fractions for a low-temperature deposited material that includes AlN a single-crystal nitride semiconductor material. However, the applicants have been unable to find any teaching that the AlN molar fractions differ by no more than 0.1, as recited in claim 3 or that they differ by more than

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0.03, as recited in claim 4.

Thus, since Takeuchi does not explicitly disclose "the second AlN molar fraction differs from the first AlN molar fraction by no more than 0.1", as recited in the applicants' claim 3, or "the second AlN molar fraction differs from the first AlN molar fraction by more than 0.03", Takeuchi does not disclose every feature recited in the applicants' claim 3 or claim 4 and the rejection of the applicants' claim 3 and claim 4 is improper.

Claim 7

The applicants respectfully traverse the rejection of their claim 7 because Takeuchi's Figure 8 does not show every feature claimed in claim 7.

The official action states:

Takeuchi show in Fig. 8 a substrate 21, a layer of GaN 23, and a layer 30 sandwiched between the substrate 21 and the layer of GaN 23.

Claim 7 recites in part "additionally comprising a substrate structure under the buffer layer". In its rejection of claim 1, the official action points to Takeuchi's layer 30 as the buffer layer of the claimed nitride semiconductor layer structure. The applicants respectfully submit that it is logically impossible for Takeuchi's layer 30 to be both the buffer layer and a layer sandwiched between two other layers in a substrate structure described in claim 7 as "under the buffer layer". Layer 30 cannot be "under" itself.

Thus, since Takeuchi does not disclose "a substrate structure under the buffer layer, the substrate structure including a substrate; a layer of GaN; and a layer of a low-temperature-deposited semiconductor material sandwiched between the substrate and the layer of GaN", as recited in the applicants' claim 7, Takeuchi does not disclose every feature recited in the applicants' claim 7 and the rejection of the applicants' claim 7 is improper.

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D. CLAIM REJECTIONS UNDER 35 USC § 103(a)

Claims 12-13 are rejected under 35 USC § 103(a) as being unpatentable over United States patent application publication 2001/0038656 of Takeuchi et al. (*Takeuchi*) in view of United States patent no. 5,530,715 of Shieh et al. (*Shieh*).

The applicants respectfully traverse the rejection of their claims 12 and 13 because the proposed combination of references is improper and because claims 12 and 13 do not read on the proposed combination of references. *Takeuchi's* Figure 8 does not show every feature claimed in claim 1.

The official action states:

For the benefit of a semiconductor layer structure, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide *Takeuchi* a gradient layer as taught by *Shieh*.

The applicants respectfully submit that the proposed combination of references is improper because the official action does not satisfy the requirements set forth in MPEP § 706.02(j). The official action provides no indication of where in the cited references may be found some suggestion or motivation to combine the teachings of the references to solve the problem that faced the applicants before they made the invention with a reasonable expectation of success. The MPEP specifically states that the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not on applicants' disclosure. Accordingly, the applicants respectfully submit that the proposed combination of references is improper and that the rejection of claims 12 and 13 under 35 USC § 103(a) is consequently improper.

The official action further states:

Takeuchi disclose all limitations of the claims except for a gradient layer. *Shieh* teach a gradient layer (Abstract, line 4).

The applicants respectfully disagree and submit that the proposed

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combination of references does not teach or suggest all the claim limitations, as required by MPEP § 706.02(j). The applicants respectfully submit that Takeuchi does not "disclose all limitations the claims except for the gradient layer." As described above with reference to claim 1, Takeuchi does not disclose every feature claimed in claim 1.

Moreover, the applicants respectfully note that the official action does not indicate where in Shieh's disclosure may be found a teaching of the AlN molar fraction profiles claimed in claim 13. Accordingly, the applicants respectfully submit that the official action has not indicated how the proposed combination of references teaches or suggests all the claim limitations, as required by MPEP § 706.02(j).

Thus, the applicants respectfully submit that the rejection of claims 12 and 13 is improper because the proposed combination of references is improper and because, even if the proposed combination of references were proper, the proposed combination of references does not teach or suggest all of the limitations of claims 12 and 13.

The applicants respectfully request reconsideration of the rejected claims. The applicants believe that the application as now amended is in condition for allowance, and respectfully request such favorable action. If any matters remain outstanding in the application, the Examiner is respectfully invited to telephone the applicants' attorney at (650) 485-3015 so that these matters may be resolved.

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Respectfully submitted,
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